



Designation: A1063/A1063M – 22

# Standard Specification for Steel Sheet, Twin-Roll Cast, Zinc-Coated (Galvanized) by the Hot-Dip Process<sup>1</sup>

This standard is issued under the fixed designation A1063/A1063M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

## 1. Scope\*

1.1 This specification covers steel sheet, produced by the Twin-Roll Cast process (see [Appendix X2](#)) and zinc-coated (galvanized) by the hot-dip process in coils and cut lengths.

NOTE 1—See [Appendix X2](#) for a description of the Twin-Roll Cast process.

1.2 The product is produced in various zinc coating weights [masses] or coating designations as shown in [Table 1](#).

1.3 Product furnished under this specification shall conform to the applicable requirements of the latest issue of Specification [A924/A924M](#) unless otherwise provided herein.

1.4 The product is available in a number of designations, grades, and classes and in the two following general categories that are designed to be compatible with different application requirements.

1.4.1 Steels with mandatory chemical requirements and typical mechanical properties.

1.4.2 Steels with mandatory chemical requirements and mandatory mechanical properties.

1.5 This material is available in the following sizes:

1.5.1 *Thickness*—up to 0.078 in. [2.0 mm].

1.5.2 *Width*—up to 79 in. [2000 mm].

1.6 The text of this specification references notes and footnotes that provide explanatory material. These notes and footnotes, excluding those in tables and figures, shall not be considered as requirements of this specification.

1.7 *Units*—This specification is applicable to orders in either inch-pound units (as A1063) or SI units (as A1063M). Values in inch-pound and SI units are not necessarily equivalent. Within the text, SI units are shown in brackets. Each system shall be used independently of the other.

1.8 Unless the order specifies the “M” designation (SI units), the product shall be furnished to inch-pound units.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.11 on Sheet Specifications.

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1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

[A90/A90M](#) Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings  
[A370](#) Test Methods and Definitions for Mechanical Testing of Steel Products

[A568/A568M](#) Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

[A653/A653M](#) Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

[A902](#) Terminology Relating to Metallic Coated Steel Products

[A924/A924M](#) Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

[A1122/A1122M](#) Test Method for Bend Testing of Metallic-Coated Steel Sheet to Evaluate Coating Adhesion

[B6](#) Specification for Zinc

[B852](#) Specification for Continuous Galvanizing Grade (CGG) Zinc Alloys for Hot-Dip Galvanizing of Sheet Steel

## 3. Terminology

3.1 *Definitions*—See Terminology [A902](#) for definitions of general terminology relating to metallic-coated hot-dip products.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

\*A Summary of Changes section appears at the end of this standard

TABLE 1 Weight [Mass] of Coating Requirements (Total Both Sides)<sup>A,B</sup>

NOTE 1—Use the information provided in 8.1.2 to obtain the approximate coating thickness from the coating weight [mass].

| Coating Designation | Minimum Requirement                          |                                              |
|---------------------|----------------------------------------------|----------------------------------------------|
|                     | Inch-Pound Units                             |                                              |
|                     | Triple-Spot Test (TST)<br>oz/ft <sup>2</sup> | Single-Spot Test (SST)<br>oz/ft <sup>2</sup> |
| G01                 | 0.01                                         | 0.01                                         |
| G30                 | 0.30                                         | 0.25                                         |
| G40                 | 0.40                                         | 0.30                                         |
| G60                 | 0.60                                         | 0.50                                         |
| G90                 | 0.90                                         | 0.80                                         |
| G100                | 1.00                                         | 0.90                                         |
| G115                | 1.15                                         | 1.00                                         |
| G140                | 1.40                                         | 1.20                                         |
| G165                | 1.65                                         | 1.40                                         |
| G185                | 1.85                                         | 1.60                                         |
|                     | SI Units                                     |                                              |
|                     | Triple-Spot Test (TST)<br>g/m <sup>2</sup>   | Single-Spot Test (SST)<br>g/m <sup>2</sup>   |
|                     |                                              |                                              |
| Z03                 | 3                                            | 3                                            |
| Z90                 | 90                                           | 75                                           |
| Z120                | 120                                          | 90                                           |
| Z180                | 180                                          | 150                                          |
| Z275                | 275                                          | 235                                          |
| Z305                | 305                                          | 275                                          |
| Z350                | 350                                          | 300                                          |
| Z450                | 450                                          | 385                                          |
| Z500                | 500                                          | 425                                          |
| Z550                | 550                                          | 475                                          |
| Z600                | 600                                          | 510                                          |

<sup>A</sup> The coating designation is the term by which the minimum triple spot, total both sides coating weight [mass] is specified. Because of the many variables and changing conditions that are characteristic of continuous hot-dip coating lines, the zinc coating is not always evenly divided between the two surfaces of a coated sheet, nor is it always evenly distributed from edge to edge. However, minimum single-spot coating weight [mass] on any one side is normally not less than 40 % of the single-spot total both sides requirement.

<sup>B</sup> As it is an established fact that the atmospheric corrosion resistance of zinc coated sheet products is a direct function of coating thickness (weight [mass]), the selection of thinner (lighter) coating designations will result in almost linearly reduced corrosion performance of the coating. For example, heavier galvanized coatings perform adequately in bold atmospheric exposure whereas the lighter coatings are often further coated with paint or a similar barrier coating for increased corrosion resistance. Because of this relationship, products carrying the statement “meets ASTM A1063/A1063M requirements” should also specify the particular coating designation.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *differentially coated, n*—galvanized steel sheet having a specified “coating designation” on one surface and a significantly lighter specified “coating designation” on the other surface.

3.2.1.1 *Discussion*—The single side relationship of either specified “coating designation” is the same as shown in the note of Table 1 regarding uniformity of coating.

3.2.2 *high strength low alloy steel, n*—a specific group of sheet steels whose strength is achieved through the use of microalloying elements such as columbium (niobium), vanadium, titanium, and molybdenum resulting in improved formability and weldability than is obtained from conventional carbon-manganese steels.

3.2.3 *minimized spangle, n*—the finish produced on hot-dip zinc-coated steel sheet in which the grain pattern is visible to the unaided eye, and is typically smaller and less distinct than the pattern visible on regular spangle.

3.2.3.1 *Discussion*—This finish is produced by one of two methods: either (1) the zinc crystal growth has been started but arrested by special production practices during solidification of the zinc, or (2) the zinc crystal growth is inhibited by a combination of coating-bath chemistry plus cooling during solidification of the zinc. Minimized spangle is normally produced in coating designations G90 [Z275] and lighter.

Subject to agreement of the producer, it is permissible for a user to specify limits on minimized spangle size.

3.2.4 *regular spangle, n*—the finish produced on hot-dip zinc-coated steel sheet in which the zinc crystal structure is visible to the unaided eye.

3.2.4.1 *Discussion*—Solidification of the zinc coating is typically uncontrolled, which produces the variable grain size associated with this finish and is not subject to size limits. Refer to Terminology A902 for a general definition of the term spangle.

3.2.5 *spangle-free, n*—the uniform finish of small, equiaxed grains produced on hot-dip zinc-coated steel sheet in which the visual spangle pattern, especially the surface variations created by spangle formation, is difficult to discern with the unaided eye.

3.2.5.1 *Discussion*—This finish is produced when the zinc crystal growth is inhibited by a combination of coating-bath chemistry, or cooling, or both, during solidification of the zinc.

## 4. Classification

4.1 The material is available in several designations as follows:

4.1.1 Commercial steel (CS Types A, B, and C),

4.1.2 Structural steel (SS), and

4.1.3 High strength low alloy steel (HSLA).

**TABLE 2 Chemical Requirements<sup>A</sup> for Twin Roll Cast Hot Rolled Steel Sheet Designations CS**

| Designation               | Composition, %—Heat Analysis Element,<br>Maximum (unless otherwise shown) |      |       |       |                   |                 |                 |      |      |      |       |                    |       |              |
|---------------------------|---------------------------------------------------------------------------|------|-------|-------|-------------------|-----------------|-----------------|------|------|------|-------|--------------------|-------|--------------|
|                           | C                                                                         | Mn   | P     | S     | Al <sup>B,C</sup> | Si <sup>C</sup> | Cu <sup>D</sup> | Ni   | Cr   | Mo   | V     | Cb/Nb <sup>F</sup> | Ti    | N            |
| CS<br>Type A              | 0.10                                                                      | 0.70 | 0.030 | 0.035 | <sup>A</sup>      | <sup>A</sup>    | 0.25            | 0.20 | 0.15 | 0.06 | 0.008 | 0.008              | 0.008 | <sup>A</sup> |
| CS<br>Type B <sup>E</sup> | 0.02 to<br>0.15                                                           | 0.70 | 0.030 | 0.035 | <sup>A</sup>      | <sup>A</sup>    | 0.25            | 0.20 | 0.15 | 0.06 | 0.008 | 0.008              | 0.008 | <sup>A</sup> |
| CS<br>Type C              | 0.15                                                                      | 0.80 | 0.030 | 0.035 | <sup>A</sup>      | <sup>A</sup>    | 0.50            | 0.30 | 0.30 | 0.15 | 0.008 | 0.008              | 0.008 | <sup>A</sup> |

<sup>A</sup> There is no requirement, but the analysis shall be reported.

<sup>B</sup> When aluminum deoxidized steel is required, it may be ordered to a minimum of 0.01 % total aluminum.

<sup>C</sup> Twin-roll cast product shall be deoxidized using either silicon or aluminum.

<sup>D</sup> When copper steel is specified, the copper limit is a minimum of 0.20 %.

<sup>E</sup> Specify Type B to avoid carbon levels below 0.02 %.

<sup>F</sup> Columbium (Cb) and Niobium (Nb) are considered interchangeable names for Element 41 in the periodic table and both names are acceptable for use.

4.2 Structural steel and high-strength low-alloy steel are available in several grades based on mechanical properties. Structural steel Grade 80 is available in two classes and high-strength low-alloy grades 45 through 80 are available in two classes.

4.3 The material is available zinc-coated in several coating weights [masses] or coating designations as shown in [Table 1](#), and

4.3.1 The material is available with the same or different coating designations on each surface.

## 5. Ordering Information

5.1 Zinc-coated sheet in coils and cut lengths is produced to thickness requirements expressed to 0.001 in. [0.01 mm]. The thickness of the sheet includes both the base metal and the coating.

5.2 Orders for product to this specification shall include the following information, as necessary, to adequately describe the desired product:

5.2.1 Name of product (steel sheet, twin-roll cast, zinc-coated (galvanized));

5.2.2 Designation of sheet [CS (Types A, B, and C), SS (Limits L or H), and HSLAS (Limits L or H)];

5.2.2.1 When a CS type is not specified, CS Type B will be furnished.

5.2.3 When a SS or HSLAS designation is specified, state the appropriate grade, or class, or combination thereof;

5.2.3.1 When a class for SS Grade 80 is not specified, Class 1 will be provided.

5.2.3.2 When a class for HSLAS is not specified, Class 1 will be provided.

5.2.4 Specify Limit L or Limit H for Cu, Ni, Cr, and Mo;

5.2.4.1 When the limit L or H is not specified, limit H will be furnished.

5.2.5 ASTM designation number and year of issue as A1063 for inch-pound units or A1063M for SI units;

5.2.6 Coating designation;

5.2.7 Chemically treated or not chemically treated;

5.2.8 Oiled or not oiled;

5.2.9 Finish (minimized spangle, regular spangle, or spangle-free);

5.2.10 Extra smooth (if required);

5.2.11 Dimensions (show thickness, minimum or nominal, width, flatness requirements, and length, if cut lengths). The purchaser shall specify the appropriate table of thickness tolerances in Specification [A924/A924M](#) that applies to the order, that is, the table of thickness tolerances for 3/8-in. [10-mm] edge distance, or the table of thickness tolerances for 1-in. [25-mm] edge distance;

5.2.12 Coil size requirements (specify maximum outside diameter (OD), acceptable inside diameter (ID), and maximum weight [mass]);

5.2.13 Packaging;

5.2.14 Certification, if required, heat analysis and mechanical property report;

5.2.15 Application (part identification and description);

5.2.16 Special requirements (if any); and

5.2.17 Supplementary Requirement, please specify.

NOTE 2—Typical ordering descriptions are as follows: steel sheet, zinc-coated, commercial steel Type A, Limit H, ASTM A1063, Coating Designation G90, chemically treated, oiled, minimum 0.040 by 34 by 117 in., for stock tanks, or steel sheet, zinc-coated, high strength low alloy steel Grade 340, class 1, Limit L, ASTM /A1063M, Coating Designation Z275, minimized spangle, not chemically treated, oiled, minimum 1.00 by 920 mm by coil, 1520-mm maximum OD, 600-mm ID, 10 000-kg maximum, for tractor inner fender.

NOTE 3—The purchaser should be aware that there are variations in manufacturing practices among the producers and therefore is advised to establish the producer's standard (or default) procedures for thickness tolerances.

## 6. Chemical Composition

### 6.1 Base Metal:

6.1.1 The heat analysis of the base metal shall conform to the requirements shown in [Table 2](#) for CS (Types A, B, and C), [Table 3](#) for SS and HSLAS, and [Table 4](#) for Cu, Ni, Cr, and Mo.

6.1.2 Each of the elements listed in [Tables 2-4](#) shall be included in the report of heat analysis. When the amount of copper, nickel, chromium, or molybdenum is less than 0.02 %, report the analysis as either <0.02 % or the actual determined value. When the amount of vanadium, titanium, or columbium is less than 0.008 %, report the analysis as either <0.008 % or the actual determined value.

6.1.3 See Specification [A924/A924M](#) for chemical analysis procedures and product analysis tolerances.

TABLE 3 Chemical Requirements<sup>A,B</sup> for Twin Roll Cast Hot Rolled Steel Sheet Designations SS and HSLAS

| Designation                         | Composition, %—Heat Analysis Element, max<br>(unless otherwise shown) |      |       |      |                 |                 |              |                    |              |   |
|-------------------------------------|-----------------------------------------------------------------------|------|-------|------|-----------------|-----------------|--------------|--------------------|--------------|---|
|                                     | C                                                                     | Mn   | P     | S    | Al <sup>C</sup> | Si <sup>C</sup> | V            | Cb/Nb <sup>G</sup> | Ti           | N |
| SS: <sup>D</sup>                    |                                                                       |      |       |      |                 |                 |              |                    |              |   |
| Grade 33 [230]                      | 0.20                                                                  | 1.35 | 0.035 | 0.04 |                 |                 | 0.008        | 0.008              | 0.008        |   |
| Grade 37 [255]                      | 0.20                                                                  | 1.35 | 0.035 | 0.04 |                 |                 | 0.008        | 0.008              | 0.008        |   |
| Grade 40 [275]                      | 0.25                                                                  | 1.35 | 0.035 | 0.04 | A               | A               | 0.008        | 0.008              | 0.008        | A |
| Grade 45 [305]                      | 0.25                                                                  | 1.35 | 0.035 | 0.04 | A               | A               | 0.008        | 0.008              | 0.008        | A |
| Grade 50 [340]                      | 0.25                                                                  | 1.35 | 0.035 | 0.04 | A               | A               | 0.008        | 0.008              | 0.008        | A |
| Grade 55 [380]                      | 0.25                                                                  | 1.35 | 0.035 | 0.04 | A               | A               | 0.008        | 0.008              | 0.008        | A |
| Grade 60 [410]                      | 0.25                                                                  | 1.35 | 0.035 | 0.04 | A               | A               | 0.008        | 0.008              | 0.008        | A |
| Grade 70 [480]                      | 0.25                                                                  | 1.35 | 0.035 | 0.04 | A               | A               | 0.008        | 0.008              | 0.008        | A |
| Grade 80 [550]                      | 0.25                                                                  | 1.35 | 0.035 | 0.04 | A               | A               | 0.008        | 0.008              | 0.008        | A |
| Classes 1 and 2                     |                                                                       |      |       |      |                 |                 |              |                    |              |   |
| HSLAS: <sup>E</sup>                 |                                                                       |      |       |      |                 |                 |              |                    |              |   |
| Grade 45 [310] Class 1 <sup>D</sup> | 0.22                                                                  | 1.35 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | A |
| Grade 45 [310] Class 2              | 0.15                                                                  | 1.35 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | A |
| Grade 50 [345] Class 1 <sup>D</sup> | 0.23                                                                  | 1.35 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | A |
| Grade 50 [345] Class 2              | 0.15                                                                  | 1.35 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | A |
| Grade 55 [380] Class 1 <sup>D</sup> | 0.25                                                                  | 1.35 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | A |
| Grade 55 [380] Class 2              | 0.15                                                                  | 1.35 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | A |
| Grade 60 [410] Class 1              | 0.26                                                                  | 1.50 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | A |
| Grade 60 [410] Class 2              | 0.15                                                                  | 1.50 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | A |
| Grade 65 [450] Class 1              | 0.26                                                                  | 1.50 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | F |
| Grade 65 [450] Class 2              | 0.15                                                                  | 1.50 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | F |
| Grade 70 [480] Class 1              | 0.26                                                                  | 1.65 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | F |
| Grade 70 [480] Class 2              | 0.15                                                                  | 1.65 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | F |
| Grade 80 [550] Class 1              | 0.26                                                                  | 1.65 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | F |
| Grade 80 [550] Class 2              | 0.15                                                                  | 1.65 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | F |
| Grade 100 [700] Class 1             | 0.26                                                                  | 1.75 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | F |
| Grade 100 [700] Class 2             | 0.15                                                                  | 1.75 | 0.04  | 0.04 | A               | A               | 0.005<br>min | 0.005<br>min       | 0.005<br>min | F |

<sup>A</sup> There is no requirement, but the analysis shall be reported.

<sup>B</sup> The limits for Copper, Nickel, Chromium, and Molybdenum are shown in Table 4.

<sup>C</sup> The twin-roll cast product shall be deoxidized using either silicon or aluminum.

<sup>D</sup> For each reduction of 0.01 % below the specified carbon maximum, an increase of 0.06 % manganese above the specified maximum will be permitted up to a maximum of 1.50 %.

<sup>E</sup> HSLAS steels contain the strengthening elements columbium (niobium), vanadium, titanium, and molybdenum added singly or in combination. The minimum requirements only apply to the microalloy elements selected for strengthening of the steel.

<sup>F</sup> The purchaser has the option of restricting the nitrogen content. It should be noted that, depending on the microalloying scheme (for example, use of vanadium) of the producer, nitrogen is permitted as a deliberate addition. Consideration should be made for the use of nitrogen binding elements (for example).

<sup>G</sup> Columbium (Cb) and Niobium (Nb) are considered interchangeable names for Element 41 in the periodic table and both names are acceptable for use.

**6.2 Zinc Bath Analysis**—The bath metal used in continuous hot-dip galvanizing shall contain not less than 99 % zinc, with a lead level not exceeding 0.009 %.

NOTE 4—To control alloy formation and promote adhesion of the zinc coating with the steel base metal, the molten coating metal composition normally contains a percentage of aluminum usually in the range from 0.05 to 0.25. This aluminum is purposely supplied to the molten coating bath, either as a specified ingredient in the zinc spelter or by the addition of a master alloy containing aluminum. Specification B852 specifies continuous galvanizing grade (CGG) zinc alloys, including multiple zinc alloys, that enable the molten coating metal to be controlled within 0.05 to 0.25 % aluminum and to not exceed 0.009 % lead. Specification B6

specifies certain grades of zinc that do not exceed 0.009 % lead but contain lower levels of aluminum.

NOTE 5—The producer can demonstrate compliance to the maximum lead level through reference to the chemical test certificates received from the zinc supplier.

## 7. Mechanical Properties

7.1 Structural steel, and high-strength low-alloy steel, shall conform to the mechanical property requirements in Table 5 for the grade, or class, or both. The typical ranges of mechanical properties (nonmandatory) for CS types A, B, and C are shown in Table 6.

